[Note] Volatilization at High Temperature from $\text{Na}_2\text{O}-\text{K}_2\text{O}-$
 $(\text{B}_2\text{O}_3+\text{SiO}_2)$ and $\text{Na}_2\text{O}-\text{Li}_2\text{O}-(\text{B}_2\text{O}_3+\text{SiO}_2)$ Systems

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[ノート] 高温における $\text{Na}_2\text{O}-\text{K}_2\text{O}-(\text{B}_2\text{O}_3+\text{SiO}_2)$ および $\text{Na}_2\text{O}-\text{Li}_2\text{O}-$
 $(\text{B}_2\text{O}_3+\text{SiO}_2)$ 系ガラスの揮発

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The volatilization from the melt of $\text{Na}_2\text{O}-\text{K}_2\text{O}-$
 $(\text{B}_2\text{O}_3+\text{SiO}_2)$ and $\text{Na}_2\text{O}-\text{Li}_2\text{O}-(\text{B}_2\text{O}_3+\text{SiO}_2)$ systems
at high temperature was measured.

In the composition range of $\text{Na}_2\text{O}-\text{B}_2\text{O}_3-\text{SiO}_2$
system, where $\text{Na}_2\text{O} < 1/2 \text{B}_2\text{O}_3$ in mole basis, the
volatilization loss increased with the increase of
 Na_2O content, while the effect of B_2O_3 content
on volatilization could not be found. In the com-
position range of the same system where $\text{Na}_2\text{O} >$
 $1/2 \text{B}_2\text{O}_3$, however, the effect of B_2O_3 content on
volatilization was found¹⁾. Sodium borates were
presumed to be the main volatilizing compounds
in this system. In case where Na_2O in the melt
is replaced by other kind of alkali oxide, different
behavior of volatilization is expected since stable
compound of each alkali and boron oxide at gas-
eous state is usually different²⁾. But non of such
measurmen has been carried out.

Composition in mole basis of glasses examined
was 80~85% SiO_2 , the sum of alkali oxide con-
tents was less than 8%, and the ratio of B_2O_3 to
 SiO_2 was kept approximately 12/80. Purified sand,
reagent grade boric acid and alkali carbonates were
used for raw materials and were melted in a
platinum crucible in a gas fired furnace at 1550°C
for 6 hours. Some of the glasses containing more
than one per cent of lithium oxide were opacified
on cooling. Composition of the glasses are shown
in Table 1.

Volatilization loss was measured for 5g of
pulverized glass in a platinum crucible of 16 mm
in diameter at $1410^\circ \pm 10^\circ\text{C}$ for 6 hours. Dry air
was introduced into the heating chamber at the
flow rate of 50 cc/min during the measurment as
described in the previous paper¹⁾.

As shown in Fig. 1, the loss is proportional to
heating time at least in the initial three hours of
heating procedure. It suggests that the volatili-
zation process is related to not only diffusion but

Table 1. Composition of sample glasses. (mol%)

Sample	SiO_2	B_2O_3	Na_2O	K_2O	Li_2O
NO 6	81.0	13.8	5.17	—	—
K 5 NM	83.5	13.2	3.30	—	—
K 2.5 NM	83.4	12.6	4.03	—	—
L 2.5 NM	80.7	11.9	7.37	—	—
L 1 NM	81.1	12.9	5.95	—	—
Si 81	82.2	13.8	3.97	—	—
B 16	81.3	14.4	4.28	—	—
NA 6	81.4	12.3	6.32	—	—
K 5 W	84.0	13.2	—	2.86	—
K 2.5 W	83.2	13.1	2.52	1.26	—
K 1 W	81.7	13.7	4.25	0.52	—
K 0.5 W*	95.0		4.68	0.28	—
L 2.5 W	80.6	12.4	2.23	—	4.75
L 1 W*	94.0		4.13	—	1.93
L 0.5 W	81.4	13.1	4.59	—	0.97
NO 6 L	82.3	13.2	—	—	4.60
NO 6 K	82.4	13.2	—	4.49	—
LN 3*	95.7		2.05	—	2.32
KN 3*	95.1		3.04	1.97	—

* Only alkali oxides were analysed and the rest was assumed
to be B_2O_3 and SiO_2 of fixed molecular ratio which is equal
to the mean value of the other samples.

also to the surface reaction^{2)~5)} which relates
closely to vapour pressure or activity of volatile
matters in the melts.

volatilization rate per unit surface area and
isovolatility line is represented on pseudoternary
diagrames of $\text{K}_2\text{O}-\text{Na}_2\text{O}-(\text{B}_2\text{O}_3+\text{SiO}_2)$ and $\text{Li}_2\text{O}-$
 $\text{Na}_2\text{O}-(\text{B}_2\text{O}_3+\text{SiO}_2)$ respectively (Fig. 2 and 3).
Replacement of Na_2O by K_2O causes a slight
increase of loss rate, while replacement of Na_2O
by Li_2O gives rise to distinct decrease. In either
case, mixed alkali effect on volatilization was not
observed. The difference of the volatilization rate
caused by whole replacement of Na_2O by K_2O or
by Li_2O is far less than the volatility from
corresponding alkali borate binary melts at the
same composition ratio measured by Tamura⁶⁾ or
Solomin⁷⁾. It is attributed to the different effect

Fig. 1. Relationships between volatilization loss and heating time at 1410°C.

Fig. 2. Volatilization rate (mg/cm·hr) of $(\text{SiO}_2 + \text{B}_2\text{O}_3) - \text{Na}_2\text{O} - \text{K}_2\text{O}$ system at 1410°C with relation to the composition (mol%).

Fig. 3. Volatilization rate (mg/cm·hr) of $(\text{SiO}_2 + \text{B}_2\text{O}_3) - \text{Na}_2\text{O} - \text{Li}_2\text{O}$ system at 1410°C with relation to the composition (mol%).

of silica on the activity of each alkali borates in the melt; when potassium borates are the main volatile ingredient, the activities of those are reduced by silica in the greatest degree while the activities of lithium borates are least affected by the presence of silica in the melt.

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〔討 論〕

プラズマフレームによる窒化物の合成

林 雄一郎・岡田 圭子・小出 重明 (76 [9] 307-12 (1968))

松本 修* 氏の意見

(1) 種々の金属の窒化反応を適当な条件で行なっているらしいですが、反応におよぼす種々の反応条件の影響について、どのような検討をされ、このような条件を選ばれたのでしょうか。

(2) 種々の金属はどのような形態でどの程度の量を用いられましたか。また収量はどの程度でしょうか。金

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属の使用量によって反応条件、生成物の形態、収量などに変化があると考えられますが如何でしょうか。また生成物の採取場所により、生成物に相異が見られませんか。

(3) 表-1 中の Yield (%) とは何を基準としてとられたものですか。また反応生成物の純度(窒素含有率でも結構です)はどの程度でしょうか。

(4) 反応温度はどの程度でしょうか。プラズマの衝撃している金属の表面温度は、かなりの高温と思われる